Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection

Daniel S. Greenbaum
Commissioner

PLANNING FOR A MUNICIPAL LEAF COMPOSTING PROGRAM

Composting can be a low-effort, cost-effective and environmentally sound way to recycle your community's leaves. It conserves scarce landfill space, reduces overall trash disposal costs, and produces a useful product. But composting is not simply piling up leaves and letting them decompose. It is a carefully managed and controlled process requiring advance planning.

This paper is an introduction to some of the issues and steps you will need to consider in planning a municipal leaf composting program. It is not meant to be a blueprint for program implementation. If your community is serious about pursuing leaf composting, we urge you to contact the Division of Solid Waste Management Regional Planner for your area or the Composting Program staff in Boston (see page 6).

As much as 35 to 50 percent of the volume of your community's solid waste stream in fall may consist of leaves. Successful composting of these leaves will require land, equipment, manpower, and the residents' cooperation. In addition, all composting operations must be registered with the Department and receive any necessary approvals. And in order for composting to be a true waste recycling solution, there must be a long-term end use for the compost itself.

Many of the activities below can be done concurrently.

. **Determine the volume of leaves you want to compost.**

Estimating your community's volume of leaves will help determine what size and type of operation is needed and how much compost will be produced. The volume of finished compost will be approximately 1/4 to 1/3 of the original volume of leaves. One way to gauge leaf volume is to have the landfill/transfer station operator monitor the landfill/transfer station, either continuously or by spot-checks during leaf season. If leaves are collected separately from the rest of the trash, this task will be easier. Based on national (EPA) figures, leaves and yard waste comprise 18% of municipal solid waste (MSW) by weight. Leaves alone comprise, on average, 6% of the MSW waste stream but can be between 5-10%.

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Figure out how you will collect the leaves.

There are three basic methods of collecting leaves for composting: a drop-off system at the local landfill or transfer station, curbside collection in bags or barrels, or bulk collection, in which leaves are scooped, raked, swept or vacuumed directly off the street.

Curbside collection of bagged leaves is more efficient than bulk collection. If residents bag their leaves, consider providing paper bags, since these are organic and can be shredded by machine or mixed in. Plastic bags must be individually opened and discarded. So-called "biodegradable" plastic bags have not been shown to biodegrade as quickly and completely as claimed.

Bulk collection is a slower method, but bulk leaves are easy to unload and don't need to be debagged. When using this method, steps must be taken to ensure the quality of the compost, due to contaminants in the street being collected with the leaves.

Evaluate different composting methods.

There are three basic methods which can be used for municipal leaf composting. The two recommended approaches involve composting the leaves in windrows, in which leaves are laid down in elongated piles, watered and mixed/aerated periodically.

The low level technology method typically involves using front-end loaders to turn, mix and aerate the windrows roughly every 4-6 weeks depending on the temperature. After 8-12 months, the leaves can be moved into large curing piles to make way for the next year's leaves and the compost is ready for use by the next spring. The length of composting depends on the rate and effectiveness of turning. This system can be modified in some cases for towns that lack available DPW staff but have sufficient space. Under this 'passive system' the leaves are windrowed and turned once or twice a year, yielding finished compost every 2 to 3 years. Each year a new windrow must be built and the finished one removed. Although this is a passive method, it still requires management. The finished compost must be removed on a consistent basis, the site must be large enough to accommodate at least three year's collection of leaves, and it must be isolated from populated areas because of potential odors generated during turning.

The intermediate level technology typically involves using specialized windrow turning machines that more thoroughly shred, turn and aerate the windrows than a front-end loader. Windrow turners can turn windrows in a fraction of the time it would take front-end loader to turn the same volume. Windrows are turned every week or two, resulting in more rapid decomposition. Leaves can be fully composted in 4-6 months, approximately half the time of the low technology method. This method is more appropriate for large scale or regional operations (i.e., 4,000 tons or more) and may be more cost-

effective because of the greater efficiency of windrow turning machines.

In static pile or forced aeration composting, leaf piles are aerated by a fan or blower and perforated pipes. Composting can be completed in 3-9 months. This method is not very practical for leaf composting because it requires more site design, planning and equipment engineering than the other methods. It is more appropriate when leaves are used as a bulking agent for sludge composting.

- **Choose a site.**

Possible composting sites might include farms, forests, municipally-owned land, parks, or other open, available land. Windrow composting generally requires about one acre of land for every 4,000 to 5,000 cubic yards of delivered leaves. Criteria for a site include:

- A central, accessible location with good traffic flow
- Easy entry and exit for leaf deliveries
- A water source for wetting windrows
- A minimum of 400 feet from a public water supply well
- A minimum of 100 feet from a wetland or floodplain
- Adequate buffer area to protect neighbors from odors
- Prevailing winds should be away from sensitive neighbors
- A low water table (to prevent flooding of the site)
- A high soil percolation rate, to avoid standing water
- A level or slightly sloping surface (1-3% grade)
- A means of securing the site from illegal dumping

- **Assess what equipment you have or will need.**

The basic equipment needed depends on your method. Windrow systems require turning equipment such as a front-end loader or a windrow turner (if warranted by the size of the operation).

Monitoring equipment can be a simple 0-200 degree Fahrenheit thermometer with a 3 to 4 foot stem. You will need a system for recording the temperatures, turning dates, quantities of leaves delivered, general observations, etc.

Screeners and/or shredders are only needed if a very high quality product is required, if incoming material is high in litter or other debris, or if a very short turnover time is required. Shredders are available in a number of sizes, with varying mesh sizes, and may be stationary or trailer-mounted.

Since composting is a seasonal operation, it is often possible to save money by using existing DPW, highway or sanitation department equipment, such as trucks, front-end loaders, shredders, chippers and some farm equipment. If your community is small, you may want to consider teaming up with a neighboring community and sharing equipment and sites.

Order any processing and monitoring equipment needed well in advance, since it may take 2-3 months to arrive.

- **Assess what personnel you can hire or "borrow" for the type of operation you have chosen.**

  A minimum of one person (full-time equivalent) is needed to monitor leaf deliveries, supervise and run the composting operation and keep records. Additional personnel may be necessary to collect and transport leaves to the site. There should also be trained backup personnel. The majority of man-hours required will be in the fall as leaves are being deposited in the windrows. Subsequently, the piles will have to be turned once every 4-6 weeks.

- **Determine what site alterations are needed and estimate their cost.**

  Alterations might include regrading the surface (a slight grade, about 1-3%, is desirable), building access roads, laying gravel, landscaping to make the site more aesthetically appealing, and in special cases, installing an impermeable base with surface runoff collection. Other alterations to consider include security measures, so that unwanted materials will not be dumped at the site. For cost analysis, see the Department's worksheet, "Economics of Composting Leaf and Yard Waste".

  Any site preparations should be completed by October so that the site will be ready for the autumn leaf fall.

- **Determine one or more end-users for your compost.**

  As a general rule, the higher the quality of the compost, the easier it will be to find end users. In-town applications, such as municipal parks, recreation areas and roadsides, landfills, or residents' lawns and gardens, will minimize the need for "marketing." Other bulk users might include landscapers, cemeteries, golf courses, and nurseries. With the addition of animal manures or other high nitrogen materials, the compost may have fertilizer value in addition to being a soil amendment.

- **Register the proposed operation and acquire any necessary approvals.**

  A proposed leaf composting operation must be registered with the Department using the Department's registration form. The form should be submitted to the DEP's Boston and appropriate Regional office at least 60 days prior to the commencement of any site preparations. Upon receipt of the registration form, DEP staff will review the planned operation and conduct a site visit to ensure that the site and operation meet the Department's guidelines.

  If the site was previously used for landfilling refuse, approval must be obtained from the regional office of DEP in addition to submittal of the registration form.

  The registration form requires: a detailed site plan, a composting pad design showing slope and layout of windrows, an explanation of the composting operation, a listing of equipment

and personnel, monitoring techniques for both the process and the end-product, provisions for control of odors and runoff from the operation, and a contingency plan if the operation ceases.

If the scope or location of a composting operation changes significantly, a new registration form must be submitted.

- **Alert and educate residents about your composting plan.**

An ongoing public education program will help maintain long-term interest and participation. While composting is still in the planning stages, consider holding public meetings and/or distributing materials to explain its economic and environmental benefits and alleviate concerns about its effects on the surrounding area.

You may want to consider establishing a citizen's advisory committee which could contribute ideas during planning and monitor ongoing operations. If possible, designate a staff member to field inquiries about the program.

If a town vote is needed to approve the program, be sure that written information is available. Make sure a system is also in place to keep the Board of Health, the Advisory Committee and others informed of the project's status.

If paper leaf bags are to be used in your collections, contact local stores well in advance of leaf season to encourage them to stock the bags. If a different method of bag distribution is to be used, be sure it is planned and publicized well in advance.

About two weeks before actual composting begins, you may want to distribute flyers or do a mailing to residents to alert them to the upcoming program and their responsibilities. Regular follow-up publicity campaigns, after a year's or a season's operation, are important for on-going participation, because they let residents know their efforts have helped the community (through reduced leaf disposal costs, avoided purchases of soil amendment, etc.). These campaigns should be conducted annually, or after each season's operation.

- **Develop a protocol for monitoring the composting operation.**

In order to maintain an efficient operation and develop a safe, attractive product, you should regularly record the volume of incoming leaves, the temperature of the windrows, and any odors or other problems. If the finished compost is going to be made available to the general public, it should be tested for contaminants, particularly if street sweepings were composted. The analyses should also include the compost's nutrient value. The data will help you evaluate the success of your operation and decide whether to alter your process.

- **Devise a system for tracking costs and benefits.**

  Records showing the economic benefits that composting provides your community will help justify the renewed costs on next year's budget. Benefits may be expressed in the form of avoided "tipping fees"; the volume of landfill space conserved; avoided transportation costs; money saved through not having to buy compost; or any actual revenues received from sale of the compost. See the "Economics of Composting Leaf and Yard Waste" worksheet.

  Benefits include not only monetary factors, but environmental benefits, such as land conservation and revitalization of soils.

- **Train staff.**

  Train operators, supervisors, collection crews and backup personnel. It is a good idea to train members of the advisory committee as well, if one exists.

CONTACTS FOR MORE INFORMATION:

Composting Program Staff

Jack Macy	(617)292-5628
Sumner Martinson	(617)292-5969
Ann McGovern	(617)292-5834

Regional Solid Waste Planners/Contacts

Carl Natho, Southeast	(508)946-2828
John McMichael, Central	(508)792-7653
Michael Youdelman, Northeast	(617)935-2160
Karen Michalski, Western	(413)784-1100

Table Collection Options

Procedure and/or Equipment	Advantages	Disadvantages
A. Bagged leaves	Keeps leaves out of street and prevents blowing leaves. Pickup not sensitive to weather. Pickup at low cost without specialized equipment. Instructions can be printed on bags provided by the town.	Cost of bags. Time required for debagging. Plastic in compost must be avoided.
1. Bag type:		
(a) Nonbiodegradable plastic.	Lower cost of bag. Debris can be removed when bag is emptied.	Costs and possible shortage of labor for emptying bags.
(b) Biodegradable and photodegradable plastic.	Little information is now available on the use of these bags for leaf collection or how they break down during composting.	
(c) Biodegradable paper.	Convenience in bagging and greater compaction than with plastic bags.	Higher cost of bag. Extra effort in the distribution of special bags. Shredding may be required. Possible increase in time needed for composting.
2. Equipment and procedure.		
(a) Compactor truck.	Large quantity per load due to compaction.	High equipment costs unless the compactor is used for other purposes.
(i) Empty bag into compactor.	Maximum opportunity for removal of debris. Efficient dumping into windrows. Eliminates debagging operation at site.	Inefficient use of compactor.
(ii) Empty bag at composting site.	Pickup may be quicker.	Inconvenience in emptying bags and forming piles or windrows.
(b) Dump truck.*	No specialized equipment.	Small quantity per load in absence of compaction.
B. Loose leaves		
1. Location of piles:		
(a) Curbside.	Avoid problems associated with leaves in the street.	Raking of leaves by collection crew is labor intensive, especially when collection is by front end loader. More extraneous material in leaves.
(b) In street.	Most convenient for collection in absence of parked cars.	Danger to children playing in leaves. Danger of fire from catalytic converters. Either raking or repeated collec-

*Bags can be either hand loaded directly or piled into a front end loader and then lifted into the truck.

Source: Leaf Composting: A Guide for Municipalities, State of Connecticut Department of Environmental Protection, Local Assistance and Program Coordination Unit, Recycling Program, January 1989.

Table Collection Options — continued

Procedure and/or Equipment	Advantages	Disadvantages
		tion if cars are parked on the street. More extraneous material in leaves.
2. Vacuum leaf collector with discharge into wire or mesh-covered box on dump truck or trailer.	Leaves are shredded to some degree and are compacted, especially if somewhat damp.	Ineffective if excessively wet or frozen. Dust if dry. Noise. Moderate expense for specialized equipment.
(a) Mounting options: (i) On trailer with discharge into truck.	Load one truck while another is in transit.	Potential danger to operator and inconvenience from operation at rear of truck.
(ii) On front of truck (on hoist used for snow plow).	Driver can see operator.	Not generally available with belt drive.
(iii) On trailer with leaf box.	Can be pulled with any type of truck including one equipped for snow plowing and sanding.	Inconvenience in backing trailer to unload. Potential danger to operator and inconvenience from operation at the rear of the truck.
(b) Drive options: (i) Belt.	Belt drive reduces vibration from impeller to engine which reduces maintenance costs and increases service life.	Higher initial cost.
(ii) On engine crankshaft.	Lower initial costs.	Vibration from impeller increases maintenance costs and decreases service life.
(iii) Power take-off.	Intermediate cost relative to other options.	Intermediate cost relative to other options.
3. Catch basin cleaner.	Large units (12 inch suction hose) are fast and effective with sufficient suction for collection of wet leaves.	Small units (6-8 inch suction hose) are slow and clog in excessively wet or freezing conditions. Very high initial costs. Rather high maintenance costs. Noise.
4. Front end loader and dump truck.	Specialized equipment is optional. Effective with wet and/or slightly frozen leaves. Efficiency can be increased if front end loader works with a small snow plow and final cleanup is with a street sweeper.	Leaves must be raked into the street. (A tractor-pulled rake can be used only in suburban areas.) Inefficient with dry leaves.
5. Front end loader and compactor truck with chute for receiving leaves.	Same as in number 4 except that effective capacity is much greater with a compactor.	Same as in number 4.

GRASS CLIPPINGS

Let Them Work For You

Grass clippings can be put to better use than bagging and disposal. A garbage bag of clippings contains up to 1/4 pound of usable organic nitrogen and other nutrients. You can put this natural fertilizer to work in your lawn or garden and save the time and effort you would have used to rake or empty grass clippings into expensive garbage bags. At the same time, you will save your municipality the cost of disposing of this material, an average of $60 per ton in Massachusetts. During the summer months, grass clippings can account for 25-40% of residential trash. Save your community money and help improve the environment by recycling this valuable organic material in your own backyard.

Below are three options for utilizing your grass clippings.

OPTION 1: LEAVE GRASS CLIPPINGS ON THE LAWN.

Why:

Left on the lawn, grass clippings:

- save raking and bagging time and labor.
- add several pounds of nitrogen and other nutrients to your lawn over the course of a season, reducing the need for additional fertilization.
- reduce water evaporation from the lawn and provide a cushioning layer which reduces lawn wear.
- break down quickly because they contain 75-85% water.

How:

* Mow when grass is dry and 3"-4" tall.
* Never remove more than 1/3 of the blade in one mowing to avoid injuring the grass plants.
* Keep the lawn at a height of 2"-3" to encourage a deep root system and better resistance to drought and stress.
* Keep the mower blade sharp to reduce damage to grass.
* A mulching mower or mulching attachment are recommended because they produce very small clippings.
* Limit the use of lawn chemicals and do not over-fertilize your lawn.
* If there is more than 1/2" layer of thatch, remove it before leaving clippings on the lawn so the clippings will reach the soil.

OPTION 2: COMPOST

Why:

- Grass clippings are a valuable source of nitrogen for your compost pile, especially if you compost a lot of leaves (see the DEP's Backyard Composting brochure).
- In addition to increasing the nutrient value of the finished compost, grass clippings speed up the composting process.

How:

* Mix grass clippings thoroughly with the other material in the pile so they do not become too compacted.
* Turn the pile regularly to prevent odors.

OPTION 3: MULCH

Why:

- Grass clippings can be used for mulch in your garden or planting beds. Mulching adds nutrients to soil, reduces weed problems, helps retain moisture, and contributes to good soil structure. It also minimizes erosion by protecting the soil surface.

How:

* Spread grass clippings around plants. Do not pile mulch up against the plant stems.
* Do not mulch with grass that was recently treated with pesticides. Chemically treated clippings should be left on the lawn or composted. Most herbicides break down in 6-8 weeks.

Prepared by the Massachusetts Department of Environmental Protection (DEP), Division of Solid Waste Management, One Winter Street, 4th Floor, Boston, MA 02108.

For more information on yard waste composting contact the DEP Compost Staff at (617) 292-5960 or 292-5834.

For more information on lawn care, maintenance, and renovation, contact your County Cooperative Extension Service.

References:

University of Massachusetts Cooperative Extension; "Lawn Mowing and Efficient Watering," by Dr. Richard J. Cooper, Turfgrass Specialist. Garden Tip Sheet L-551.

University of Massachusetts Cooperative Extension; "Lawn Maintenance and Renovation," by Dr. Richard J. Cooper and Sarah H. Bennett. Garden Tip Sheet L-550.

Wisconsin Department of Natural Resources Bureaus of Solid Waste Management; "Grass Clippings: Good as Gold for Your Lawn," by Wendy McCown. PUBL-SW-073 87.

THERMOMETERS

The thermometer is the most important piece of monitoring equipment to purchase for your leaf composting operation. The temperature of the leaf piles indicates when those piles should be turned (below 100°F or above 140°F) in order to maintain the optimum environment for microbial activity.

When ordering your thermometer, specify:

1. A 36" long pointed stem
2. A temperature range of 0° - 200°F
3. A 3" or 5" diameter dial
4. Stainless steel (stronger than aluminum)
5. Plastic or acrylic lens (optional)

The following companies supply dial thermometers which fit the specifications stated above. Prices were confirmed in October 1988. This is a partial listing and does not represent an endorsement by the Department of Environmental Quality.

Reotemp Instrument Corporation
11568 Sorrento Valley Road #10
San Diego, CA 92121
(619) 481-7737
Model: A
Cost: $56.00 + shipping
Availability: 3-5 working days

Omega Engineering, Inc.
1 Omega Drive
Box 4047
Stamford, CT 06907
Model: S
Cost: $70.00 + shipping
Availability: 3 weeks

Meriden Cooper Corporation
112 Golden St. Park
Box 692
Meriden, CT 06450
(203)237-8448
Model: Tel-Tru GT 300R
Cost: $75.50 + shipping
Availability: 6 weeks

Walden Instrument Supply Company
910 Main Street
Wakefield, MA 01880
(617) 245-2944
Model: Ashcroft 30 E150R 360
Cost: $57.45 + shipping
Availability: 6-8 weeks